

PATENT

Serial No. 09/919,232

Amendment in Reply to Final Office Action of September 19, 2005

IN THE CLAIMS

Please amend claims 1, 6-7, 18-20 and 22 as follows:

1. (Currently Amended) An acoustic imaging system, comprising:  
a transducer including a two-dimensional transducer element  
matrix array encased by a protective cover and a transducer body,  
the protective cover having a non-uniform thickness and configured  
to mate with a protective cover mounting portion of the transducer  
body, the protective cover for being superposed above the two-  
dimensional transducer element matrix such that acoustic energy  
incident at the protective cover from the two-dimensional  
transducer element matrix is mechanically directed by the  
protective cover of the non-uniform thickness, wherein the  
protective cover further comprises an acoustic material for  
exhibiting an acoustic impedance corresponding to an acoustic  
impedance of a body to be imaged and further having a shape that  
includes a tissue-engagement surface and curved surfaces adjacent  
the tissue-engagement surface, the shape specified to provide an  
optimum contact with the body to be imaged, wherein the curved  
surfaces are configured to align the tissue-engagement surface in

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relation to an acoustic window defined by geometry-limited access points of the body to be imaged; and

an image processing system coupled to the transducer and configured to provide a plurality of individualized excitation signals each being delayed by a predetermined delay with respect to each other according to a two-dimensional delay profile to control respective transducer elements of the plurality of transducer elements at different times for controlling lateral and elevation dimensions of the transmit aperture of the acoustic imaging system over time to compensate for the shape of the protective cover such that the two-dimensional transducer element matrix array generates and transmits acoustic energy through the protective cover over time such that acoustic energy transmitted through the protective cover is electronically focused according to the two-dimensional delay profile, wherein the image processing system electronically focuses transmitted acoustic energy at a target position within the body to be imaged through the protective cover as a function of (i) a position of each element of the two-dimensional transducer element array matrix, (ii) a thickness of the protective cover over a corresponding transducer element, and (iii) the target position

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within the body to be imaged, thereby by electronically compensating for the focusing characteristics of the protective cover as a function of non-uniform acoustic delays caused introduced by the protective cover.

Claim 2 (Canceled)

3. (Previously Presented) The acoustic imaging system of claim 1, wherein at least one of the dimensions of the two-dimensional transducer element matrix array is curved.

Claim 4 (Canceled)

5. (Previously Presented) The acoustic imaging system of claim 1, wherein the protective cover has an acoustic impedance of between approximately 1.3Mrayl and 1.7MRayl.

6. (Currently Amended) The acoustic imaging system of claim 1, wherein the protective cover has a transducer-engagement end having a the tissue-engagement surface, the transducer-engagement end

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being configured to engage the transducer body, and the tissue engagement surface forming a portion of a substantially cylindrical surface.

7. (Currently Amended) The acoustic imaging system of ~~claim 6~~ claim 1, wherein the tissue engagement surface forms a portion of a substantially spherical surface.

8. (Previously Presented) The acoustic imaging system of claim 1, wherein the transducer body is ergonomically adapted to be grasped by the hand of an operator.

Claims 9-11 (Canceled)

12. (Previously Presented) The acoustic imaging system of claim 1, wherein the image processing system receives a plurality of individualized receive mode signals from a plurality of transducer elements, the receive mode signals representative of the incident acoustic energy at a plurality of the transducer elements

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of the two-dimensional transducer element matrix array that traverses the protective cover.

Claims 13-17 (Canceled)

18. (Currently Amended) A method for acoustically imaging a patient, comprising the steps/acts of:

providing a transducer having a two-dimensional transducer element matrix array encased by a protective cover and a transducer body, the protective cover having a non-uniform thickness and configured to mate with a protective cover mounting portion of the transducer body, the protective cover for being superposed above the two-dimensional transducer element matrix such that acoustic energy transmitted from the protective cover and into the body is mechanically directed by the protective cover of the non-uniform thickness, wherein the two-dimensional transducer element matrix array and the protective cover are shaped to reduce patient discomfort, further wherein the protective cover further comprises an acoustic material for exhibiting an acoustic impedance corresponding to an acoustic impedance of a body to be imaged and

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further having a shape that includes a tissue-engagement surface and curved surfaces adjacent the tissue-engagement surface, the shape specified to provide an optimum contact with the body to be imaged, wherein the curved surfaces are configured to align the tissue-engagement surface in relation to an acoustic window defined by geometry-limited access points of the body to be imaged;

generating a plurality of time delayed transmit signals each for separately controlling a respective transducer element of the two-dimensional transducer element matrix array to electronically focus acoustic transmit waves that traverse through the protective cover, the plurality of time delayed transmit signals each being delayed by a predetermined delay with respect to each other according to a two-dimensional delay profile to control respective transducer elements of the plurality of transducer elements at different times for controlling lateral and elevation dimensions of a transmit aperture over time to compensate for the shape of the protective cover such that the two-dimensional transducer element matrix array generates and transmits acoustic energy through the protective cover over time according to the two-dimensional delay profile; and

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receiving a plurality of time delayed response echoes at the separately controllable individual transducer elements of the two-dimensional transducer element matrix array to electronically focus acoustic receive echoes that traverse the protective cover, wherein the image processing system electronically focuses transmitted acoustic energy at a target position within the body to be imaged through the protective cover as a function of (i) a position of each element of the two-dimensional transducer element array matrix, (ii) a thickness of the protective cover over a corresponding transducer element, and (iii) the target position within the body to be imaged, thereby by electronically compensating for the focusing characteristics of the protective cover as a function of non-uniform acoustic delays caused introduced by the protective cover.

19. (Currently Amended) The method of claim 18, further comprising the step-act of: processing the reflected acoustic echoes to generate an image.

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20. (Currently Amended) The method of claim 18, further comprises the steps acts of:

accessing an the acoustic window of a patient; and

transmitting acoustic energy through the protective cover and into the patient via the acoustic window.

Claim 21 (Canceled)

22. (Currently Amended) The method of claim 20, wherein the step act of accessing an the acoustic window comprises an acoustic window formed between adjacently disposed ribs of the patient.